4.4 GLOBAL CLIMATE CHANGE

4.4.1 INTRODUCTION

This section presents existing conditions and analyzes the potential global climate impacts associated with the implementation of the proposed Gallery at Central Park project. This section also provides a description of the regulatory framework for management of global climate change on a federal, state, regional, and local level.

The analysis of global climate impacts is based on climate change regulations that will be administered by the California Air Resources Board (CARB). CARB is responsible for implementing the Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32). As discussed in further detail below, AB 32 provides the first enforceable statewide program to limit greenhouse gas (GHG) emissions from all major industries with penalties for noncompliance. Other sources of information used in this assessment include the US Environmental Protection Agency's (US EPA) *Compilation of Air Pollutant Emission Factors* (AP 42).

This discussion focuses on the project's potential GHG emissions and their potential impact on global climate. It is also important to recognize that the effects of global climate change, in particular, global warming, can result in impacts to the project itself. For example, coastal projects may be adversely affected by rising sea levels resulting from the melting of continental ice sheets or projects relying substantially on water supplied by snowmelt in the Sierra Nevada that can be affected by declining snowmelt. The project site is located inland from the coast and 8 miles from the San Francisco Bay and would be less likely to be affected by sea level changes and the project is located in an area where water is supplied largely by groundwater, and less by surface water sources that could be susceptible to reduction due to declining snowmelt. Given this, the proposed project is not expected to be adversely affected by environmental changes resulting from global climate change except to the extent those changes affect all of California (e.g., higher average temperatures).

4.4.2 ENVIRONMENTAL SETTING

4.4.2.1 Greenhouse Effect

Description of Greenhouse Effect

Heat retention within the atmosphere is an essential process to sustain life on Earth. The natural process through which heat is retained in the troposphere[1] is called the "greenhouse effect." The greenhouse

[1] The troposphere is the bottom layer of the atmosphere, which varies in height from the Earth's surface to 10 to 12 kilometers).

effect traps heat in the troposphere through the following three-fold process: short-wave radiation emitted by the Sun is absorbed by the Earth; the Earth emits a portion of this energy in the form of long-wave radiation; and GHGs in the upper atmosphere absorb this long-wave radiation and emit this long-wave radiation into space and toward the Earth. This "trapping" of the long-wave (thermal) radiation emitted back toward the Earth is the underlying process of the greenhouse effect. Without the greenhouse effect, the Earth's average temperature would be approximately -18 degrees Celsius (°C) (0 degrees Fahrenheit [°F]) instead of its present 14 °C (57 °F) (National Climatic Data Center 2008). The most abundant GHGs are water vapor and carbon dioxide. Many other trace gases have greater ability to absorb and re-radiate long-wave radiation; however, these gases are not as plentiful. For this reason, and to gauge the potency of GHGs, scientists have established a Global Warming Potential (GWP) for each GHG based on its ability to absorb and re-radiate long-wave radiation. The GWP of a gas is determined using carbon dioxide as the reference gas with a GWP of 1.

Greenhouse Gases

Primary Greenhouse Gases

Greenhouse gases include, but are not limited to, the following:[2]

- **Carbon dioxide (CO_2).** Carbon dioxide is primarily generated by fossil fuel combustion in stationary and mobile sources. Due to the emergence of industrial facilities and mobile sources in the past 250 years, the concentration of carbon dioxide in the atmosphere has increased 35 percent (US EPA 2008a). Carbon dioxide is the most widely emitted GHG and is the reference gas (GWP of 1) for determining GWPs for other GHGs. In 2004, 83.8 percent of California's GHG emissions were carbon dioxide (California Energy Commission 2006).

- **Methane (CH_4).** Methane is emitted from biogenic sources, incomplete combustion in forest fires, landfills, manure management, and leaks in natural gas pipelines. In the United States, the top three sources of methane come from landfills, natural gas systems, and enteric fermentation (US EPA n.d.[a]). Methane is the primary component of natural gas, which is used for space and water heating, steam production, and power generation. The GWP of methane is 21.

- **Nitrous oxide (N_2O).** Nitrous oxide is produced by both natural and human-related sources. Primary human-related sources include agricultural soil management, animal manure management, sewage treatment, mobile and stationary combustion of fossil fuel, adipic acid production, and nitric acid production. The GWP of nitrous oxide is 310.

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2 All GWPs are given as 100-year GWP. Unless noted otherwise, all GWPs were obtained from the Intergovernmental Panel on Climate Change. 1996. *Climate Change 1995: The Science of Climate Change – Contribution of Working Group I to the Second Assessment Report of the IPCC*. Cambridge (UK): Cambridge University Press.

- **Hydrofluorocarbons (HFCs).** HFCs are typically used as refrigerants for both stationary refrigeration and mobile air conditioning. The use of HFCs for cooling and foam blowing is growing as the continued phase-out of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) gains momentum. The GWP of HFCs range from 140 for HFC-152a to 6,300 for HFC-236fa.

- **Perfluorocarbons (PFCs).** PFCs are compounds consisting of carbon and fluorine. They are primarily created as a byproduct of aluminum production and semiconductor manufacturing. Perfluorocarbons are potent GHGs with a GWP several thousand times that of carbon dioxide, depending on the specific PFC. Another area of concern regarding PFCs is their long atmospheric lifetime (up to 50,000 years) (Energy Information Administration n.d.). The GWPs of PFCs range from 5,700 to 11,900.

- **Sulfur hexafluoride.** Sulfur hexafluoride is a colorless, odorless, nontoxic, nonflammable gas. It is most commonly used as an electrical insulator in high-voltage equipment that transmits and distributes electricity. Sulfur hexafluoride is the most potent GHG that has been evaluated by the IPCC with a GWP of 23,900. However, its global warming contribution is not as high as the GWP would indicate due to its low mixing ratio compared to carbon dioxide (4 parts per trillion [ppt] in 1990 versus 365 parts per million [ppm]) (US EPA n.d.[b]).

- **Water vapor (H_2O).** Although water vapor has not received the scrutiny of other GHGs, it is the primary contributor to the greenhouse effect. Water vapor and clouds contribute 66 to 85 percent of the greenhouse effect (water vapor alone contributes 36 to 66 percent) (Schmidt 2005). Natural processes such as evaporation from oceans and rivers and transpiration from plants contribute 90 percent and 10 percent of the water vapor in our atmosphere, respectively (US Geological Survey 2007). The primary human-related source of water vapor comes from fuel combustion in motor vehicles; however, this is not believed to contribute a significant amount (less than 1 percent) to atmospheric concentrations of water vapor (Energy Information Administration 2008). Therefore, the control and reduction of water vapor emissions is not within reach of human actions. The Intergovernmental Panel on Climate Change (IPCC) has not determined a GWP for water vapor.

Other Greenhouse Gases

In addition to the six major GHGs discussed above (excluding water vapor), many other compounds have the potential to contribute to the greenhouse effect. Some of these substances were previously identified as stratospheric ozone depletors; therefore, their gradual phase-out is currently in effect. A few of these compounds are discussed below:

- **Hydrochlorofluorocarbons (HCFCs).** HCFCs are solvents, similar in use and chemical composition to CFCs. The main uses of HCFCs are for refrigerant products and air conditioning systems. As part of the Montreal Protocol, all developed countries that adhere to the protocol are subject to a consumption cap and gradual phase-out of HCFCs. The United States is scheduled to achieve a 100 percent reduction to the cap by 2030. The GWPs of HCFCs range from 93 for HCFC-123 to 2,000 for HCFC-142b (US EPA 1996).

- **1,1,1-trichloroethane**. 1,1,1-trichloroethane or methyl chloroform is a solvent and degreasing agent commonly used by manufacturers. In 1992, the US EPA issued Final Rule 57 FR 33754 scheduling the phaseout of methyl chloroform by 2002 (US EPA 2007). Therefore, the threat posed by methyl

chloroform as a GHG will diminish. Nevertheless, the GWP of methyl chloroform is 110 times that of carbon dioxide (US EPA 1996).

- **Chlorofluorocarbons (CFCs).** CFCs are used as refrigerants, cleaning solvents, and aerosol spray propellants. CFCs were also part of the US EPA's Final Rule 57 FR 3374 for the phaseout of ozone depleting substances. Currently, CFCs have been replaced by HFCs in cooling systems and a variety of alternatives for cleaning solvents. Nevertheless, CFCs remain suspended in the atmosphere, contributing to the greenhouse effect. CFCs are potent GHGs with GWPs ranging from 4,600 for CFC-11 to 14,000 for CFC-13 (US EPA 2006).

- **Ozone.** Ozone occurs naturally in the stratosphere where it is largely responsible for filtering harmful ultraviolet (UV) radiation. In the troposphere, ozone acts as a GHG by absorbing and re-radiating the infrared energy emitted by the Earth. As a result of the industrial revolution and rising emissions of oxides of nitrogen (NO_X) and volatile organic compounds (VOCs) (ozone precursors), the concentrations of ozone in the troposphere have increased (IPCC n.d.). Due to the short life span of ozone in the troposphere, its concentration and contribution as a GHG is not well established. However, the greenhouse effect of tropospheric ozone is considered small, as the radiative forcing[3] of ozone is 25 percent of that of carbon dioxide (IPCC 2007).

Contributions to Greenhouse Gas Emissions

Global

Anthropogenic GHG emissions worldwide as of 2005 (the latest year for which data are available for Annex 1 countries) totaled approximately 30,800 CO_2 equivalent million metric tons ($MMTCO_2E$).[4] It should be noted that global emissions inventory data are not all from the same year and may vary depending on the source of the emissions inventory data (UNFCCC n.d.[a] and UNFCCC n.d.).[5] Six countries and the European Community accounted for approximately 70 percent of the total global emissions (See **Table 4.4-1, Six Top GHG Producer Countries and the European Community**). The GHG emissions in more recent years may be substantially different than those shown in **Table 4.4-1**.

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3 Radiative forcing, measured in Watts/m2, is an externally imposed perturbation (e.g., stimulated by greenhouse gases) in the radiative energy budget of the Earth's climate system (i.e., energy and heat retained in the troposphere minus energy passed to the stratosphere).

4 The CO_2 equivalent emissions are commonly expressed as "million metric tons of carbon dioxide equivalent ($MMTCO_2E$)" The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP, such that $MMTCO_2E$ = (million metric tons of a GHG) x (GWP of the GHG). For example, the GWP for methane is 21. This means that emissions of one million metric tons of methane are equivalent to emissions of 21 million metric tons of CO_2.

5 The global emissions are the sum of Annex 1 and non-Annex 1 countries without counting Land-Use, Land-Use Change and Forestry (LULUCF). For countries that 2004 data were unavailable, the UNFCCC data for the most recent year were used.

Table 4.4-1
Six Top GHG Producer Countries and the European Community

Emitting Countries	GHG Emissions ($MMTCO_2E$)*
United States	7,241.5[1]
China	4,882.7[2]
European Community	4,192.6[1]
Russian Federation	2,132.5[1]
India	1,606.5[2]
Japan	1,359.9[1]
Germany[3]	1,001.5[1]
Total	**22,417.2**

Sources

[1] *United Nations Framework Convention on Climate Change http://unfccc.int/ghg_emissions_data/ghg_data_from_unfccc/time_series_annex_i/items/3841.php*

[2] *GHG emissions for China and India (Calendar Year 2000) were obtained from the World Resources Institute's Climate Analysis Indicators Tool (CAIT) http://www.cait.wri.org/cait.php*

[3] *Germany's GHG emissions are included in the European Community.*

* *Excludes emissions/removals from land use, land-use change and forestry (LULUCF)*

United States

As noted in **Table 4.4-1**, the United States was the top producer of greenhouse gas emissions as of 2005. Based on GHG emissions in 2004, six of the states—Texas, California, Pennsylvania, Ohio, Illinois, and Florida, in ranked order—would each rank among the top 30 GHG emitters internationally (World Resources Institute 2006). The primary greenhouse gas emitted by human activities in the United States was CO_2, representing approximately 84 percent of total greenhouse gas emissions (US EPA 2008b). Carbon dioxide from fossil fuel combustion, the largest source of US greenhouse gas emissions, accounted for approximately 80 percent of US GHG emissions (US EPA 2008b).

California

Based on the 2004 GHG inventory data (the latest year available) compiled by CARB for the California 1990 greenhouse gas emissions inventory, California emitted emissions of 484 $MMTCO_2E$, including emission resulting from out-of-state electrical generation (CARB 2007). Based on the CARB inventory and GHG inventories for countries contributing to the worldwide GHG emissions inventory compiled by the United Nations Framework Convention on Climate Change (UNFCCC) for 2005, California's GHG emissions rank second in the United States (Texas is number one) with emissions of 423 $MMTCO_2E$

(excluding emissions related to imported power) and internationally between Ukraine (418.9 $MMTCO_2E$) and Spain (440.6 $MMTCO_2E$) (UNFCCC n.d.[a]).

A California Energy Commission (CEC) emissions inventory report placed CO_2 produced by fossil fuel combustion in California as the largest source of GHG emissions in 2004, accounting for 81 percent of the total GHG emissions (CEC 2006a). CO_2 emissions from other sources contributed 2.8 percent of the total GHG emissions, methane emissions 5.7 percent, nitrous oxide emissions 6.8 percent, and the remaining 2.9 percent was composed of emissions of high-GWP gases (CEC 2006a). These high GWP gases are largely composed of refrigerants and a small contribution of sulfur hexafluoride (SF_6) used as insulating materials in electricity transmission and distribution.

The primary contributors to GHG emissions in California are transportation, electric power production from both in-state and out-of-state sources, industry, agriculture and forestry, and other sources, which include commercial and residential activities. These primary contributors to California's GHG emissions and their relative contributions are presented in **Table 4.4-2, GHG Sources in California**.

Table 4.4-2
GHG Sources in California[1]

Source Category	Annual GHG Emissions ($MMTCO_2E$)[a]	Percent of Total	Annual GHG Emissions ($MMTCO_2E$)[b]	Percent of Total
Agriculture	27.9	5.8%	27.9	6.6%
Commercial Uses	12.8	2.6%	12.8	3.0%
Electricity Generation	119.8	24.7%	58.5	13.8%
Forestry (excluding sinks)	0.2	0.0%	0.2	0.0%
Industrial Uses	96.2	19.9%	96.2	22.7%
Residential Uses	29.1	6.0%	29.1	6.9%
Transportation	182.4	37.7%	182.4	43.1%
Other[c]	16.0	3.3%	16.0	3.8%
Totals	**484.4**	**100.0%**	**423.1**	**100.0%**

Sources:

[1] *California Air Resources Board. California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit. November 16, 2007.*

[a] *Includes emissions associated with imported electricity, which account for 61.3 $MMTCO_2E$ annually.*

[b] *Excludes emissions associated with imported electricity.*

[c] *Unspecified combustion and use of ozone-depleting substances.*

It should be noted that emissions from each of these economic sectors are not confined to emissions from a single process, since there is crossover with other sectors. For example, the GHG emissions from cement production places clinker manufacturing in its own category and the fuel used to heat the cement production process within the industrial fuel category. In the case of landfills, methane emissions and CO_2 emissions and sinks are reported in their respective portions of the inventory. Taken together, the CO_2 sinks approximately offset the landfill methane emissions. Additionally, fuel-related GHG emissions from transporting wastes to landfills are included in transportation fuels.

Global Climate Change

Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer) (US EPA 2008). Climate change may result from

- natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun;
- natural processes within the climate system (e.g., changes in ocean circulation, reduction in sunlight from the addition of GHG and other gases to the atmosphere from volcanic eruptions); and
- human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, desertification).

Indications of Anthropogenic Influences

The impact of anthropogenic activities on global climate change is readily apparent in the observational record. For example, surface temperature data shows that 11 of the 12 years from 1995 to 2006 rank among the 12 warmest since 1850, the beginning of the instrumental record for global surface temperature (IPCC 2007). In addition, the atmospheric water vapor content has increased since at least the 1980s over land, sea, and in the upper atmosphere, consistent with the capacity of warmer air to hold more water vapor; ocean temperatures are warmer to depths of 3,000 feet; and a marked decline has occurred in mountain glaciers and snowpack in both hemispheres, and in polar ice and ice sheets in both the Artic and Antarctic regions (IPCC 2007).

Influence of Industrialization

Air trapped by ice has been extracted from core samples taken from polar ice sheets to determine the global atmospheric variation of carbon dioxide, methane, and nitrous oxide from before the start of the industrialization, around 1750, to over 650,000 years ago. For that period, it was found that carbon dioxide concentrations ranged from 180 ppm to 300 ppm. For the period from around 1750 to the present,

global carbon dioxide concentrations increased from a pre-industrialization period concentration of 280 ppm to 379 ppm in 2005, with the 2005 value far exceeding the upper end of the pre-industrial period range (IPCC 2007). Global methane and nitrous oxide concentrations show similar increases for the same period (see **Table 4.4-3, Comparison of Global Pre-Industrial and Current GHG Concentrations**).

Table 4.4-3
Comparison of Global Pre-Industrial and Current GHG Concentrations[1]

Greenhouse Gas	Early Industrial Period Concentrations (ppm)	Natural Range for Last 650,000 Years (ppm)	2005 Concentrations (ppm)
Carbon Monoxide	280	180 to 300	379
Methane	715	320 to 790	1774
Nitrous Oxide	270	NA	319

Source:
[1] *Intergovernmental Panel on Climate Change, "Climate Change 2007"*

Effects of Global Climate Change

The primary effect of global climate change has been a rise in average global tropospheric temperature of 0.2 degrees Celsius per decade, determined from meteorological measurements world-wide between 1990 and 2005 (IPCC 2007). Climate change modeling using 2000 emission rates shows that further warming would occur, which would induce further changes in the global climate system during the current century (IPCC 2007). Changes to the global climate system and ecosystems and to California would include, but would not be limited to

- the loss of sea ice and mountain snowpack resulting in higher sea levels and higher sea surface evaporation rates with a corresponding increase in tropospheric water vapor due to the atmosphere's ability to hold more water vapor at higher temperatures; (IPCC 2007)
- a rise in global average sea level primarily due to thermal expansion and melting of glaciers and ice caps, the Greenland and Antarctic ice sheets; (IPCC 2007)
- changes in weather that include widespread changes in precipitation, ocean salinity, and wind patterns, and more energetic aspects of extreme weather including droughts, heavy precipitation, heat waves, extreme cold, and the intensity of tropical cyclones; (IPCC 2007)
- the decline of Sierra snowpack, which accounts for approximately half of the surface water storage in California, by 70 percent to as much as 90 percent over the next 100 years; (California EPA Climate Action Team 2006)

- an increase in the number of days conducive to ozone formation by 25 to 85 percent (depending on the future temperature scenario) in high ozone areas of Los Angeles and the San Joaquin Valley by the end of the 21st century (California EPA Climate Action Team 2006); and

- high potential for erosion of California's coastlines and sea water intrusion into the Delta and associated levee systems due to the rise in sea level (California EPA Climate Action Team 2006).

4.4.3 REGULATORY CONSIDERATIONS

4.4.3.1 International Activities

Kyoto Protocol

The original Kyoto Protocol was negotiated in December 1997 and came into force on February 16, 2005. As of April 2008, 180 countries and the European Economic Community have ratified the agreement (UNFCCC n.d.[c]). The US has not ratified the protocol. Participating nations are separated into Annex 1 (i.e., industrialized countries) and Non-Annex 1 (i.e., developing countries) countries that have differing requirements for GHG reductions. The goal of the protocol is to achieve overall emissions reduction targets for six GHGs by the period 2008 to 2012. The six GHGs regulated under the protocol are carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFCs, and PFCs. Each nation has an emissions reduction target under which they must reduce GHG emissions a certain percentage below 1990 levels (e.g., 8 percent reduction for the European Union, 6 percent reduction for Japan). The average reduction target for nations participating in the Kyoto Protocol is approximately five percent below 1990 levels (Pew Center on Global Climate Change n.d.). Although the United States has not ratified the protocol, it has established a target of 18 percent reduction in GHG emissions intensity by 2012 (White House n.d.). Greenhouse gas intensity is the ratio of GHG emissions to economic output (i.e., gross domestic product).

Intergovernmental Panel on Climate Change

The World Meteorological Organization (WMO) and United Nations Environmental Program (UNEP) established the IPCC in 1988. The goal of the IPCC is to evaluate the risk of climate change caused by human activities. Rather than performing research or monitoring climate, the IPCC relies on peer-reviewed and published scientific literature to make its assessment. The IPCC assesses information (i.e., scientific literature) regarding human-induced climate change, impacts of human-induced climate change, and options for adaptation and mitigation of climate change. The IPCC reports its evaluation through special reports called "assessment reports." The latest assessment report (i.e., Fourth Assessment

Report, consisting of three working group reports and a synthesis report based on the first three reports) was published in 2007.[6]

Federal Activities

In *Massachusetts vs. EPA,* the Supreme Court held that US EPA has the statutory authority under Section 202 of the CAA to regulate GHGs from new motor vehicles. President Bush signed Executive Order 13432 on May 14, 2007, directing the US EPA, along with the Departments of Transportation, Energy, and Agriculture, to initiate a regulatory process that responds to the Supreme Court's decision. The order requires the US EPA to coordinate closely with other federal agencies and to consider the president's Twenty-in-Ten plan in this process. The Twenty-in-Ten plan would establish a new alternative fuel standard that would require the use of 35 billion gallons of alternative and renewable fuels by 2017. The US EPA will be working closely with the Department of Transportation in developing new automotive efficiency standards.

California Activities

In a response to the transportation sector accounting for more than half of California's CO_2 emissions, Assembly Bill 1493 (AB 1493, Pavley) was enacted on July 22, 2002. AB 1493 required CARB to set GHG emission standards for passenger vehicles, light-duty trucks, and other vehicles determined by the state board to be vehicles whose primary use is noncommercial personal transportation in the state. The bill required that CARB set the GHG emission standards for motor vehicles manufactured in 2009 and all subsequent model years. In setting these standards, CARB must consider cost-effectiveness, technological feasibility, economic impacts, and provide maximum flexibility to manufacturers. CARB adopted the standards in September 2004. These standards are intended to reduce emissions of carbon dioxide and other greenhouse gases (e.g., nitrous oxide, methane). The new standards would phase in during the 2009 through 2016 model years. When fully phased in, the near-term (2009-2012) standards will result in a reduction of about 22 percent in greenhouse gas emissions compared to the emissions from the 2002 fleet, while the mid-term (2013-2016) standards will result in a reduction of about 30 percent. Some currently used technologies that achieve GHG reductions include small engines with superchargers, continuously variable transmissions, and hybrid electric drive. In December 2004, these regulations were challenged in federal court and their current status is currently unknown.

6 The IPCC's Fourth Assessment Report is available online at http://www.ipcc.ch/.

Executive Order S-3-05

In June 2005, Governor Schwarzenegger established California's GHG emissions reduction targets in Executive Order S-3-05. The Executive Order established the following goals: GHG emissions should be reduced to 2000 levels by 2010; GHG emissions should be reduced to 1990 levels by 2020; and GHG emissions should be reduced to 80 percent below 1990 levels by 2050. The Secretary of the California Environmental Protection Agency (Cal/EPA) is required to coordinate efforts of various agencies in order to collectively and efficiently reduce GHGs. Some of the agency representatives involved in the GHG reduction plan include the Secretary of the Business, Transportation and Housing Agency, the Secretary of the Department of Food and Agriculture, the Secretary of the Resources Agency, the Chairperson of CARB, the Chairperson of the CEC, and the President of the Public Utilities Commission. Representatives from each of the aforementioned agencies comprise the Climate Action Team. The Climate Action Team is responsible for implementing global warming emissions reduction programs. In order to achieve these goals, the Climate Action Team is organized into two subgroups: the market-based options subgroup and the scenario analysis subgroup. The California Environmental Protection Agency (Cal/EPA) secretary is required to submit a biannual progress report from the Climate Action Team to the governor and state legislature disclosing the progress made toward GHG emission reduction targets. In addition, another biannual report must be submitted illustrating the impacts of global warming on California's water supply, public health, agriculture, the coastline, and forestry, and reporting possible mitigation and adaptation plans to combat these impacts. The Climate Action Team has fulfilled both of these report requirements through its March 2006 Climate Action Team Report to Governor Schwarzenegger and the legislature (California EPA Climate Action Team 2006). Some strategies currently being implemented by state agencies include CARB introducing vehicle climate change standards and diesel anti-idling measures, the Energy Commission implementing building and appliance efficiency standards, and the Cal/EPA implementing their green building initiative. The Climate Action Team also recommends future emission reduction strategies, such as using only low-GWP refrigerants in new vehicles, developing ethanol as an alternative fuel, reforestation, solar power initiatives for homes and businesses, and investor-owned utility energy efficiency programs. According to the report, implementation of current and future emission reduction strategies have the potential to achieve the goals set forth in Executive Order S-3-05.

Assembly Bill 32

In furtherance of the goals established in Executive Order S-3-05, the Legislature enacted Assembly Bill 32 (AB 32, Nuñez and Pavley), the California Global Warming Solutions Act of 2006, which Governor Schwarzenegger signed on September 27, 2006. AB 32 represents the first enforceable statewide program to limit GHG emissions from all major industries with penalties for noncompliance.

CARB has been assigned to carry out and develop the programs and requirements necessary to achieve the goals of AB 32. The foremost objective of CARB is to adopt regulations that require the reporting and verification of statewide GHG emissions. This program will be used to monitor and enforce compliance with the established standards. The first GHG emissions limit is equivalent to the 1990 levels, which are to be achieved by 2020. CARB is also required to adopt rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emission reductions. AB 32 allows CARB to adopt market-based compliance mechanisms to meet the specified requirements. Finally, CARB is ultimately responsible for monitoring compliance and enforcing any rule, regulation, order, emission limitation, emission reduction measure, or market-based compliance mechanism adopted. In order to advise CARB, it must convene an Environmental Justice Advisory Committee and an Economic and Technology Advancement Advisory Committee. By January 2008, the first deadline for AB 32, a statewide cap for 2020 emissions based on 1990 levels and mandatory reporting rules for significant sources of GHGs must be adopted. The following year (January 2009), CARB must adopt a scoping plan indicating how reductions in significant GHG sources will be achieved through regulations, market mechanisms, and other actions.

The first action under AB 32 resulted in the adoption of a report listing early action greenhouse gas emission reduction measures on June 21, 2007. The early actions include three specific GHG control rules. On October 25, 2007, CARB approved an additional six early action GHG reduction measures under AB 32. These early action GHG reduction measures are to be adopted and enforced before January 1, 2010, along with 32 other climate-protecting measures CARB is developing between now and 2011. The report divides early actions into three categories:

- Group 1 - GHG rules for immediate adoption and implementation
- Group 2 - Several additional GHG measures under development
- Group 3 - Air pollution controls with potential climate co-benefits

The original three adopted early action regulations meeting the narrow legal definition of "discrete early action GHG reduction measures" include

- a low-carbon fuel standard to reduce the "carbon intensity" of California fuels;
- reduction of refrigerant losses from motor vehicle air conditioning system maintenance to restrict the sale of "do-it-yourself" automotive refrigerants; and
- increased methane capture from landfills to require broader use of state-of-the-art methane capture technologies.

The additional six early action regulations adopted on October 25, 2007, also meeting the narrow legal definition of "discrete early action GHG reduction measures," include

- reduction of aerodynamic drag, and thereby fuel consumption, from existing trucks and trailers through retrofit technology;
- reduction of auxiliary engine emissions of docked ships by requiring port electrification;
- reduction of perfluorocarbons from the semiconductor industry;
- reduction of propellants in consumer products (e.g., aerosols, tire inflators, and dust removal products);
- require that all tune-up, smog check and oil change mechanics ensure proper tire inflation as part of overall service in order to maintain fuel efficiency; and
- restriction on the use of SF_6 from non-electricity sectors if viable alternatives are available.

As required under AB 32, on December 6, 2007, CARB approved the 1990 greenhouse gas emissions inventory, thereby establishing the emissions limit for 2020. The 2020 emissions limit was set at 427 MMT CO_2E. The inventory revealed that in 1990 transportation, with 35 percent of the state's total emissions, was the largest single sector, followed by industrial emissions, 24 percent; imported electricity, 14 percent; in-state electricity generation, 11 percent; residential use, 7 percent; agriculture, 5 percent; and commercial uses, 3 percent.

In addition to the 1990 emissions inventory, CARB also adopted regulations requiring mandatory reporting of greenhouse gases for large facilities on December 6, 2007. The mandatory reporting regulations require annual reporting from the largest facilities in the state, which account for 94 percent of greenhouse gas emissions from industrial and commercial stationary sources in California. About 800 separate sources that fall under the new reporting rules and include electricity generating facilities, electricity retail providers and power marketers, oil refineries, hydrogen plants, cement plants, cogeneration facilities, and industrial sources that emit over 25,000 tons of carbon dioxide each year from on-site stationary combustion sources. Transportation sources, which account for 38 percent of California's total greenhouse gas emissions, are not covered by these regulations but will continue to be tracked through existing means. Affected facilities will begin tracking their emissions in 2008, to be reported beginning in 2009 with a phase-in process to allow facilities to develop reporting systems and train personnel in data collection. Emissions for 2008 may be based on best available emission data. Beginning in 2010, however, emissions reports will be more rigorous and will be subject to third-party verification. Verification will take place annually or every three years, depending on the type of facility.

Senate Bill 1368

Governor Schwarzenegger reiterated California's commitment to reducing GHGs by signing SB 1368. SB 1368 requires the CEC to develop and adopt regulations for GHG emissions performance standards for the long-term procurement of electricity by local publicly-owned utilities. The CEC must adopt the standards on or before June 30, 2007. These standards must be consistent with the standards adopted by the Public Utilities Commission. This effort will help to protect energy customers from financial risks associated with investments in carbon-intensive generation by allowing new capital investments in power plants whose GHG emissions are as low or lower than new combined-cycle natural gas plants, by requiring imported electricity to meet GHG performance standards in California and requiring that the standards be developed and adopted in a public process.

Executive Order S-1-07

On January 18, 2007, a new Low Carbon Fuel Standard (LCFS) for transportation fuels sold within the state. Executive Order S-1-07 sets a declining standard for GHG emissions measured in CO_2-equivalent gram per unit of fuel energy sold in California. The target of the LCFS is to reduce the carbon intensity of California passenger vehicle fuels by at least 10 percent by 2020. The LCFS will apply to refiners, blenders, producers, and importers of transportation fuels and will use market-based mechanisms to allow these providers to choose how they reduce emissions during the "fuel cycle" using the most economically feasible methods. The Executive Order requires the Secretary of CalEPA to coordinate with actions of the CEC, CARB, the University of California, and other agencies to develop a protocol to measure the "life-cycle carbon intensity" of transportation fuels. CARB is anticipated to complete its review of the LCFS protocols no later than June 2007 and implement the regulatory process for the new standard by December 2008.

Senate Bill 97

In August 2007, as part of the legislation accompanying the state budget negotiations, the legislature enacted SB 97 (Dutton), which directs the Governor's Office of Planning and Research (OPR) to develop guidelines under California Environmental Quality Act (CEQA) for the mitigation of greenhouse gas emissions. OPR is to develop proposed guidelines by July 1, 2009, and the Resources Agency is directed to adopt guidelines by January 1, 2010. On June 19, 2008, OPR issued a technical advisory as interim guidance regarding the analysis of GHG emissions in CEQA documents (OPR 2008). The advisory indicated that a project's GHG emissions, including those associated with vehicular traffic, energy consumption, water usage, and construction activities, should be identified and estimated. The advisory further recommended that the lead agency determine significance of the impacts and impose all mitigation measures that are necessary to reduce GHG emissions to a less than significant level. The advisory did not recommend a specific threshold of significance—either quantitative or qualitative—

leaving this to the lead agency's judgment and discretion, based upon factual data and guidance from regulatory agencies and other sources where available and applicable.

4.4.4 IMPACTS AND MITIGATION MEASURES

4.4.4.1 Significance Criteria

To date, no local or state air quality agency has adopted significance criteria for evaluation of GHG emissions. While AB 32 created a framework for the reduction of GHGs in California, the Act did not address the role of CEQA in achieving the goals of the Act. As noted earlier, in August 2007, the governor signed SB 97 (Dutton) into law which requires OPR to prepare *State CEQA Guidelines* for the mitigation of GHG emissions or the effects of greenhouse gas emissions. The Resources Agency must certify and adopt the guidelines by January 1, 2010. Despite the foregoing, this Draft EIR provides a discussion of the impacts of the project with respect to global climate change in the absence of an established significance threshold. To assess the impact of the proposed project with respect to global climate change, the project's operational GHG emissions are quantified on a carbon dioxide equivalent (CO_2E) basis. In addition, the project is evaluated as to whether it would impede or conflict with the emissions reduction targets and strategies prescribed in or developed to implement AB 32.

Impact Assessment Methodology

Similar to criteria pollutant emissions discussed in **Section 4.2, Air Quality**, GHG emissions resulting from the implementation of the proposed project would occur from two categories: short-term construction activities and long-term day-to-day operations of the proposed project. Construction activities would generate GHG emissions as a result of heavy-duty construction equipment and construction worker trips.

Following construction of the proposed project, operational GHG emissions would be generated primarily due to project-related motor vehicle trips. GHG emissions would also be generated from on-site stationary and area sources such as natural gas combustion, landscape maintenance equipment, and periodical architectural coating for building maintenance. URBEMIS2007 Version 9.2.4 was used to quantify mobile and area source GHG emissions (i.e., CO_2) resulting from the proposed project. The emissions of CO_2, the primary greenhouse gas associated with mobile and area sources estimated using URBEMIS2007 were adjusted to convert CO_2 emissions to GHG emissions on a carbon dioxide equivalent (CO_2E) basis:

- Construction diesel trucks and equipment: No adjustment was made to the CO_2 emissions because the GHGs in the exhaust from diesel engines are almost entirely CO_2 (less than one percent CH_4 and N_2O on a CO_2 equivalent basis).

- Motor vehicles: The annual CO_2 emissions associated with motor vehicle trips were multiplied by a factor based on the assumption that CO_2 represents 95 percent of the (CO_2E) emissions associated with passenger vehicles, which account for most of the project-related trips (US EPA 2005).

- Area sources (natural gas combustion): The CO_2 emissions from natural gas consumption for water and space heating were adjusted based on emission factors for CO_2, CH_4, and N_2O for natural gas combustion from the US EPA's *Compilation of Air Pollutant Emission Factors* (US EPA 1998a) and the global warming potential for each GHG.

The project would also result in indirect GHG emissions due to the electricity demands of the project. Emission factors for GHGs due to electrical demand from the proposed project's land uses were obtained from the *South Coast Air Quality Management District CEQA Air Quality Handbook*, which provides electrical demand factors for a variety of land uses and from the California Climate Action Registry General Reporting Protocol, which provides GHG emission factors for CO_2, CH_4, and N_2O for electricity in California. These emission factors take into account the current mix of energy sources used to generate electricity statewide and the relative carbon intensities of these sources, and include natural gas, coal, nuclear, large hydroelectric, and other renewable sources of energy.

Indirect GHG emissions are also associated with the electrical demand resulting from the provision of water to the project site, electrical demand and process emissions due to wastewater treatment, and decomposition of solid waste generated by the project. The electrical demand associated with supplying water to the project site was calculated based on the estimated water use (see **Section 4.6, Hydrology and Water Quality** of this Draft EIR); California Energy Commission estimates of electric use for water conveyance, treatment, and distribution (CEC 2005, 26; CEC 2006b, 22); and electrical generation factor from the California Climate Action Registry (CCAR) *General Reporting Protocol* (CCAR 2008). The wastewater-related GHG emissions were calculated based on the estimated wastewater production (see **Section 4.13, Utilities and Services Systems**) and state and federal estimates of GHG associated with wastewater treatment (CEC 2006b; US EPA 2008c) and the electrical generation factor from the CCAR *General Reporting Protocol* (CCAR 2008). Lastly, the solid waste-related emissions were calculated based on the solid waste expected to be generated by the project (see **Section 4.13, Utilities and Services Systems**) and a US EPA emission factor (US EPA 1998b).

Project Impacts and Mitigation Measures

The proposed project would generate GHG emissions as a result of its day-to-day activities, which would contribute to potential cumulative impacts of GHG emissions on global climate. Although at the time of this analysis, no quantitative GHG threshold exists for evaluation of a project's impact on global climate, the Bay Area Air Quality Management District (BAAQMD) recommends quantification of operational

GHG emissions.[7] The GHG emissions associated with area and mobile sources were estimated using the methodology described above.

A detailed summary of the GHG emissions associated with the proposed construction, area source, and mobile sources is included in **Appendix 4.4**. **Table 4.4-4**, **Estimated Construction GHG Emissions** and **Table 4.4-5**, **Gallery at Central Park Estimated Net Greenhouse Gas Emissions**, shows the proposed and existing annual GHG emissions associated with operation.

Table 4.4-4
Estimated Construction GHG Emissions

Construction Year	Emissions in Metric Tons CO_2E Per Year
2009	579
2010	1,386
2011	1,374

*Source: Impact Sciences, Inc. Emissions calculations are provided in **Appendix 4.3***

Table 4.4-5
Gallery at Central Park Estimated Net Operational Greenhouse Gas Emissions

Emissions Source	GHG Emissions (Metric Tons CO_2E Per Year)
Proposed Mobile Sources	6,955
Proposed Area Sources	1,139
Proposed Electrical Generation	4,397
Proposed Water Supply	184
Proposed Wastewater Treatment	203
Proposed Solid Waste Disposal	34
Total Proposed GHG Emissions	12,912
Existing GHG Emissions	1,016
Net New GHG Emissions	11,896

*Source: Impact Sciences, Inc. Emissions calculations are provided in **Appendix 4.4**.*
Note: Existing GHG Emissions represents the GHG emissions associated with the existing medical office buildings (30,000 square feet of medical/administrative office space).

7 Personal communication between Greg Tholen, Senior Environmental Planner, BAAQMD and George Lu, Impact Sciences, Inc.

While the proposed project would result in emissions of GHGs, no guidance exists to indicate what level of GHG emissions would be considered substantial enough to result in a significant adverse impact on global climate. However, it is generally the case that an individual project of this size is of insufficient magnitude by itself to influence climate change. Thus, GHG impacts are recognized as exclusively cumulative impacts; there are no non-cumulative GHG emission impacts from a climate change perspective (CAPCOA 2008). Accordingly, further discussion of the project's greenhouse gas emissions and their impact on global climate are provided below in the context of a cumulative impact.

Impact GCC-1: **The project would not impede or conflict with the emissions reduction targets and strategies prescribed in or developed to implement AB 32. (*Less than Significant*).**

As discussed above, to date, no quantitative emission thresholds or similar criteria have been established to evaluate the cumulative impact of a single project on global climate. In the absence of quantitative emissions thresholds, consistency with adopted programs and policies is used by many jurisdictions to evaluate the significance of a project's contribution to a cumulative impact. The project's consistency with the implementing programs and regulations to achieve the statewide GHG emission reduction goals established under AB 32 were used to evaluate the significance of the proposed project with respect to cumulative GHG emissions. The GHG emission reduction strategies applicable to the proposed project are listed below in **Table 4.4-6**, **Project Features to Achieve Climate Action Team Strategies**, along with a discussion of how the project would be consistent with the proposed strategies.

Table 4.4-6
Project Features to Achieve Climate Action Team Strategies

CAT Strategy	Implementing Agency	Project Feature
Vehicle Climate Change Standards	Air Resources Board	The project would be consistent with this strategy to the extent that new passenger vehicle and light trucks might be purchased by the project's users starting in the 2009 model year.[1]
HFC Reduction Strategies	Air Resources Board	Proposed residential unit air conditioning systems would comply with the latest standards for new systems. Use of consumer products using HFCs would comply with CARB regulations, when adopted.
Smart Land Use and Intelligent Transportation Systems	Local Lead Agency	The project site was selected for project development by the applicant to reduce automobile dependence, encourage compact development, and provide access to public spaces, walkable streets, and public transportation.

CAT Strategy	Implementing Agency	Project Feature
Green Buildings Initiative	Energy Commission	Energy performance standards have been developed as part of the project application. Energy performance standards include energy efficient standards for the heating, ventilation, and air conditioning (HVAC) system and other appliances that could be installed in residential units and common areas of the site. These appliances include centralized gas fire water heating, reversible ceiling fans to help distribute air in summer and winter, central air conditioning utilizing same ducting system as central heating, and exceed Title 24 requirements for insulation, air infiltration, and natural heating by 15 percent.
Water Use Efficiency	Department of Water Resources	Water usage and water quality standards have been developed as part of the project application (DAPs). The water usage and quality standards would promote water use reduction by using low flow toilets, water saving kitchen and lavatory faucets, use of drought tolerant native plant material, and moisture sensing irrigation override system. Other standards include storm water quality control and management on the project site.

[1] *The US EPA has denied the waiver that would allow these standards to be implemented; however, the state has filed a lawsuit to overturn this decision. The implementation of these standards and the time schedule for the introduction of compliance passenger vehicles and light trucks are in question at this time. However, if the waiver is granted, all 2009 model year passenger and light trucks purchased by project residents would be consistent with the climate change standards.*

In addition, CARB has approved a list of early action measures that can be implemented by January 1, 2010. The early action measures that are relevant to the proposed project's design features and that would be consistent with these measures are listed in **Table 4.6-7, Project Features Consistent with Early Action Measures**.

Table 4.4-7
Project Features Consistent with Early Action Measures

Early Action Measure	Project Feature (Mitigation Measure)
Low-Carbon Fuel Standard	The project would be consistent with this measure because motor vehicles driven by project residents would use compliant fuels in the future.
"Do-it-yourself" Automotive Refrigerants	The project would be consistent with this measure because the project's vehicles would be serviced by repair shops that capture and recycle automotive refrigerants.
Consumer Product Propellants	The project would be consistent with this measure because the project residents would use compliant consumer products.
Proper Tire Inflation	The project would be consistent with this measure because motor vehicles driven by project residents would maintain proper tire pressure to improve fuel economy and reduce GHG emissions.

Based on **Tables 4.4-6 and 4.4-7**, the proposed project would implement control measures to help reduce GHG emissions and subsequent global climate change. It is the goal of AB 32 and the Governor's Executive Order S-3-05 to reduce greenhouse gas emissions to previous levels (i.e., 1990 levels by 2020). To date, no specific reduction standards or benchmarks have been established for an individual project. However, as discussed in **Section 4.2, Impact AIR-6**, the proposed project would result in fewer new vehicle trips than the number that would be generated if the project site was developed at the maximum density allowed by the site's general plan land use designation. The proposed project would develop 806 residential units on the project site compared with the maximum density allowed, which would allow the development of up to 908 residential units (refer to **Section 4.7, Land Use and Planning** for a description for a range of densities allowed by the general plan at the project site). Accordingly, the project will lessen the potential contribution to the cumulative impact of GHG emissions, and the impact would thus not be cumulatively considerable. The impact on global climate would be less than significant. Nonetheless, implementation of **Mitigation Measures AIR-2a** and **AIR-2b** would help further reduce GHG emissions associated with the proposed project.

In addition, the California attorney general has prepared a list of potential mitigation measures to offset or reduce global warming impacts from local projects. A project that implements measures consistent with this list would be considered to have reduced its GHG emissions. As discussed in the paragraph above, the proposed project's operational activities would generate less motor vehicle emissions than if the project were developed at the maximum density allowed by the Santa Clara General Plan assigned

land use designation for the site. Motor vehicle emissions represent the largest source of criteria and GHG emissions associated with the proposed project. Nevertheless, global climate change is a cumulative impact and any further reduction in GHG emissions would help mitigate and avoid impacts resulting from global climate change. The list below includes a number of the suggested mitigation measures from the attorney general and describes how the project is consistent with these mitigation measures. It should be noted that many of the suggested mitigation measures have already been incorporated into the project as project design features or mitigation measures for other environmental resource topics (e.g., air quality). Therefore, the following list provides actions (i.e., project design features or mitigation measures) included in the proposed project to further reduce its contribution to the cumulative impact on global climate.

- **Suggested Attorney General Mitigation Measure**: *Design building to be energy efficient.*

  Project Consistency: In order to reduce criteria pollutant emissions, **Mitigation Measure AIR-2b** is proposed in **Section 4.2 Air Quality**. **Mitigation Measure AIR-2b** requires that all buildings comply with Title 24 energy standards. Implementation of this measure would also reduce electricity usage for air conditioning and heating in residential units, which in turn would reduce GHG emissions associated with electrical generation.

- **Suggested Attorney General Mitigation Measure:** *Use reclaimed water for landscape irrigation in new development and on public property. Install the infrastructure to deliver and use reclaimed water.*

  Project Consistency: As described in **Section 3.0, Project Description**, a recycled water line would be installed in Kiely Boulevard to allow for the use of recycled water on site for landscape irrigation. Implementation of this measure would reduce the electrical energy usage associated with pumping water. In addition, electrical energy used for the treatment of water would also be reduced.

- **Suggested Attorney General Mitigation Measure**: *Use graywater.*

  Project Consistency: As discussed above, the proposed project would use recycled water on site for landscape irrigation. This measure would reduce the electrical energy usage associated with pumping and treating graywater.

- **Suggested Attorney General Mitigation Measure:** *Devise a comprehensive water conservation strategy appropriate for the project and location.*

  Project Consistency: See discussion above for recycled water.

- **Suggested Attorney General Mitigation Measure:** *Reuse and recycle construction and demolition waste.*

Project Consistency: As discussed in **Section 3.0 Project Description** and **Section 4.2 Air Quality**, implementation of the proposed project would involve demolition of existing buildings and asphalt paving material. To the extent feasible, demolished material would be recycled for the proposed project. However, at this point in development, the exact amount of usable demolished material is not known. Nevertheless, using recycled material will reduce haul truck GHG emissions associated with removing material from the site and material delivery trucks coming to the site. Furthermore, all unused demolition materials (e.g., metal, wire, conduit, and machinery) would be hauled to a recycling firm. This measure would reduce the GHG emissions associated with production and distribution of new construction materials.

- **Suggested Attorney General Mitigation Measure:** *Include mixed-use, in-fill, and higher density development projects to support the reduction of vehicle trips, promote alternatives to individual vehicle travel, and promote efficient delivery of services and goods.*

  Project Consistency: The proposed project is a high density infill residential development. As described in **Section 4.12 Transportation and Traffic**, the proposed project would be near three Santa Clara Valley Transit Authority (VTA) bus lines. The nearest bus stop is equipped with duckouts and would be located south of the intersection of Kiely Boulevard and Kaiser Drive. Residents of the proposed project would be able to utilize public transit for retail, commercial, and worker commute trips, thereby reducing individual vehicle travel. In addition, the high density development would have a higher possibility for carpooling within the development, which would further reduce individual vehicle travel.

- **Suggested Attorney General Mitigation Measure:** *Preserve and create open spaces and parks. Preserve existing trees, and plant replacement trees at a set ratio.*

  Project Consistency: As discussed in **Section 3.0 Project Description** and **Section 4.2 Air Quality**, trees removed to construct the proposed project would be replaced at a minimum ratio of 2:1 in adherence with the City of Santa Clara's standard common practice requirements for tree removal. Therefore, implementation of the proposed project would increase the trees on the project site. Note that if all the replacement trees cannot be accommodated on site, trees would be planted off site within the vicinity of the site.

- **Suggested Attorney General Mitigation Measure:** *Develop "brownfields" and other underused or defunct properties near existing public transportation and jobs.*

  Project Consistency: As described in **Section 3.0 Project Description**, the proposed project would develop residential units on an infill site currently occupied by a vacant and unused Kaiser facility. As discussed above, the project site is located near three VTA bus lines. Therefore, the proposed project would utilize underused site as well as link residential units to existing public transportation.

- **Suggested Attorney General Mitigation Measure:** *Include pedestrian and bicycle-only streets and plazas within developments. Create travel routes that ensure destinations can be reached conveniently by public transportation, bicycling, or walking.*

  Project Consistency: As described in **Section 3.0 Project Description**, pedestrian travel would be provided throughout the project site. In addition, a multipurpose (i.e., pedestrian and bicycle) trail would run along the southeast and eastern boundaries of the project site. The multipurpose trail would lead to the intersection of Kiely Boulevard and Kaiser Drive, which would allow pedestrians and bicyclists to safely cross Kiely Boulevard to reach Central Park or the VTA bus stop.

In summary, the project's impact on global climate would be less than significant. Implementation of **Mitigation Measures AIR-2a** and **AIR-2b** would help further reduce GHG emissions associated with the proposed project.

Mitigation Measures: No mitigation required.

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